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USSR Report

ENERGY

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ENERGY

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GENERAL

DRILEX PURCHASES NEW DOWNHOLE MOTOR FROM USSR

Moscow MOSCOW NEWS in English No 22, 10-17 Jun 84 p 10

[Text]

At the World Petroleum Congress held last autumn in London a joint Soviet-English report was considered a kind of sensation by many participants. The report was about a new downhole motor purchased from the USSR by Drilex, a British firm, under a licence agreement. Thousands of metres of oil wells have been drilled with this motor in the North Sea, France, the Middle East and the USA. The US magazine "Ocean Industry" dealing with problems of offshore oil production had to admit that a new Soviet downhole motor features high torque at a low rotational speed, which results in unprecedented well-drilling rates; the new motor's drill performance surpassed all expectations.

Yuri VADETSKY, D. Sc. (Engineering), Director of the All-Union Drilling Techniques Research Institute, told our correspondent Yuri Samoilov:

The principle by which oil and gas wells are drilled in the Soviet Union differs from that practised abroad. Drilling methods used there allow rotation of the whole drill string, which comprises a multitude of pipes. It is extremely difficult to drill in this way at great depths due to the drill string's enormous force of resistance to rotation. Therefore, they have to install powerful mechanisms on the surface capable of rotating the entire many-kilometre drill string. In our country the drill string remains stationary. Only the drill bit which crushes the rock rotates. The bit is rotated by a downhole motor installed at the end of the drill string. Due to this many difficulties can be avoided.

The new downhole motor developed in our Institute is similar to a hydraulic-powered screw-type motor whose shaft is driven by the liquid supplied from the surface through the drill pipes. A merit of our motor is optimal speed of rotation of the drill bit, resulting in less wear and longer service life for the bit. This feature is extremely important, since in order to replace a worn-out drill bit, it is necessary to pull out the hole's entire drill string, which takes a lot of time. Employing the new downhole motor makes it possible to speed up drilling sharply. Furthermore, the motor is rather simple in construction.

We have been cooperating with the Drilex company since 1981, i.e., since the moment it was formed upon receiving a licence for our motor. Our British colleagues participated in commercial tests of the motor near Poltava in the Ukraine. We constantly render them technical assistance. It should be pointed out that they have also made contributions to improvements in the motor's construction. We are satisfied with the cooperation from the company's specialists. Foreign firms show great interest in the Soviet drilling equipment. Apart from a licence for the screw-type downhole motor, we could also offer our technology for drilling large-diameter holes, up to 6 metres. Such holes can be used for bridge supports, tunnels, shafts, etc. I think great interest may be shown in our reduction gear, intended for reducing the speed of rotation of the downhole motor turbodrill, which is used for drilling the super-deep Kola and Saatly holes. This reduction gear has been patented in the USA, England and other countries.

CSO: 1812/237

NON-NUCLEAR POWER

NOVOTUL'SKAYA TETS TO INSTALL SOLID FUEL GAS GENERATOR

Leningrad LENINGRADSKAYA PRAVDA in Russian 15 Jan 84 p 1

/Article by V. Chichin: "Power in Harness"/

/Text/ Steam, which has been used for a long time to generate power, has seen the appearance of a kind of twin--gas. In accordance with a project of the scientists of the scientific production association TsKTI/Central Scientific Research, Planning and Design Boiler and Turbine Institute/ imeni I. I. Polzunov, who are building a steam and gas plant with a high-pressure steam generator for the Novotul'skaya TETs, they, figuratively speaking, have found themselves in a single harness. Steam will turn its own turbine, and gas--its own.

One can be convinced of this at the association's experimental TETs. Tests of the first gas generator in the country operating on solid fuel under pressure are now going on at full speed on a special purpose large-scale test bed.

"The start-up of the experimental gas generator is an event not only for our collective. An important step has been taken in realizing one of the points in the 'Basic Directions in the Economic and Social Development of the USSR in the Years 1981-1985 and in the Period up to 1990,' with which it has been planned to build a 250,000 kilowatt prototype steam and gas plant at the Novotul'skaya TETs"--says the director of this plan, professor and doctor of technical sciences Evgeniy Nikolayevich Prutkovskiy.

We go from his office to the experimental TETs. We climb over steep metallic short ladders encircling the test bed to the very top, approximately the height of a four-story building. The test bed's control panel is located here, and multiple data is accumulated here on how the numerous units of the system are "feeling" and how the process of obtaining gas from specially imported Kuznetsk coal is proceeding.

The gas generator is a gigantic barrel in which the coal is turned into gas--the highlight of the entire plan for the Novotul'skaya TETs. What has caused the requirement to also have a gas twin along with the steam generator? Its importance, first of all, is in the fact that it can more quickly respond to the energy demands of consumers. The usual steam power unit at all electric power stations requires about five hours to "unwind." A steam and gas plant handles this task twice as fast which is particularly important in the semi-peak period of a power load schedule. The reserve, as you see, is dependable!

To build it, the association's specialists had to revise greatly the approach to designing power blocks. They have proceeded, primarily, from the notion that the course for the maximum utilization of solid fuel power engineering needs now has been clearly determined. This has also required fundamentally new engineering solutions.

Even at a distance, it is noticeable that during the experiments on the test bed, the glances of the testers, who are at the "command point," rest most often on the monitors regulating pressure. The point is that to activate the process of obtaining gas, the pressure within the gas generator is raised to five atmospheres and, in accordance with the plan for the Novotul'skaya TETs--up to 20! It is not easy to get full pressurization of the unit. Obviously therefore the developers are proudly comparing their offspring to a spaceship--here and there they use intricate airlocks to level and regulate pressure.

"All the participants in the development remember what tension reigned quite recently on the test bed during the installation," recounts the fitter-mechanic Nikolay Fedorovich Il'in who not only is actively participating in the tests but who also made and assembled with his own hands a number of the system's units. "It fitted with difficulty. Why? You see, some of the design ideas are simply unique."

"We will finish this stage and things will go more easily later"--they said then. The bases for this optimism were that the scientists and designers worked conscientiously on the project and the installers did not accept defects. However, tests are tests. Here one must be continually prepared for different, mostly annoying, surprises. It was not by accident when, after learning that the initial start-up of the gas generator was occurring, I arranged a meeting with the test director Evgeniy Kirillovich Chavchanidze and he requested that I wait, if only a couple of weeks. "Then things will be very clear, the process will have begun, or..."

Today it can be boldly confirmed that everything turned out without this "or." The first gas of the required quality was obtained on the Kuznetsk coal gasification unit.

This fact speaks most eloquently about the importance of this experiment. It is for a purpose that the power blocks of the Novotul'skaya TETs are called prototype or experimental-industrial. It begins a new generation of electric power stations in the country. The Leningrad scientists are already "playing through" variations of new power projects of a similar type on their test bed which is unique in the country. The time is not very far off when the power of one million kilowatt steam and gas blocks, operating on solid fuel, is brought into the country's fuel and power complex.

The search is continuing. During this year the association's collective has to solve an entire set of problems connected with fulfilling the order for the Novotul'skaya TETs. The construction of this major project of the five-year plan will begin next year.

8524
CSO: 1822/247

NON-NUCLEAR POWER

BRIEFS

FLOATING CITIES--Kharkov (TASS)--The Kharkov scientists from the Institute of Machine Building Problems of the UkSSR Academy of Sciences feel that building cities in the open ocean is entirely realistic in the future. They have proposed an original project to provide power to such floating settlements. "The upper layer of water in our planet's tropical and subtropical regions is warmed by the sun up to 30 degrees Celcius while, at the same time, its temperature is 5-10 degrees at a depth of several hundred meters," recounts candidate of technical sciences B. Troshen'kin. The proposal is to use this difference to produce electric power with the help of a special device. This is a turbine rotating under the pressure of a liquid steam flow which develops when warm sea water simmers in a vacuum. The steam that is used is condensed by cold water which is moved by pipeline from the ocean depths. An experimental model of such a unit, operating on the ocean's free heat, has already been tested. As calculations have shown, when using such thermal hydroelectric stations, the heated layer of the ocean can yield 20 times more power daily than now necessary for mankind. Thus the cities in the ocean will be capable not only of providing power for themselves but also of sharing it with dry land. [Text] [Moscow IZVESTIYA in Russian 5 Mar 84 p 3] 8524

NEW POWER BRIDGE OPERATIONAL--Magadan--A power bridge connecting the Arkagalinskaya GRES, the largest in Kolyma, with the tayga settlement of Ozernaya has begun operating. This 105-kilometer section is part of the LEP[electric power transmission line]-220 under construction which will feed current from the Magadan power system to Ust-Nera. The LEP-220 construction is one of the main links in carrying out the over-all development program of the productive forces of the country's northeastern section. In recent years over 1,000 kilometers of LEP have been constructed and thermal electric power stations have been modernized in Kolyma and Chukotka as part of this program. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 21 Jan 84 p 1] 8524

FAR EAST POWER PROJECTS--Khabarovsk--The kray's power projects have become the key construction projects in recent years. The capacities of the city TETs are being broadened and new LEP's are being constructed. Quite recently a high-voltage LEP-500 has supplied Zeyskaya GES power to Khabarovsk. The plan is to build such a line this year from Khabarovsk to Komsomolsk-on-Amur. These two large industrial centers of the Far East are almost 400 kilometers apart. Along the entire stretch swamps, mari, and wooded hills obstruct the path of the installers. However, in spite of the working conditions, they have resolved to complete construction of the LEP by the Day of the Power Worker. [By Yu. Baklanov] [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 7 Mar 84 p 1] 8524

LEP CONSTRUCTION COMPLETION--Tashkent 26 Feb --A new powerful flow was brought into the power system of the capital of Uzbekistan--the construction of yet another LEP has been completed. It was not necessary to construct it in zones free of built-up areas as was the case in the past. Electricity flows through an underground cable. Three of the largest GRES's--Syrdarya, Tashkent, and Angren--feed the underground line. /PRAVDA correspondent Yu. Mukimov/ /Text/ /Moscow PRAVDA in Russian 27 Feb 84 p 1/ 8524

TEST OF LARGE TURBO-GENERATOR--(LenTASS)--Tests of the first one million kilowatt high-speed turbo-generator were completed at the Elektrosila Association. The rotation speed of its rotor has doubled in comparison with earlier machines of the same potential for atomic power stations--up to 3,000 revolutions per minute. Because of design changes, the generator is 100 tons lighter than its predecessors! As the tests have shown, the new "millionaire" has a large safety margin and increased efficiency when compared with all previous machines. The state commission has recommended the generator for the Emblem of Quality. This new-design "millionaire" is being prepared for shipment to the Rovenskaya AES. /Text/ /Leningrad LENINGRADSKAYA PRAVDA in Russian 21 Mar 84 p 1] 8524

MAYSKAYA GES CONSTRUCTION--Leningrad--The Institute of Hydraulic Engineering imeni B. Ye. Vedeneyev is conducting research on the construction of the Mayskaya GES. This hydrostation--the companion of the Sayano-Shushensk power giant, will have a total capacity of 320,000 kilowatts. Its main purpose is to regulate the level of the Yenisey after it is treated by the turbine blades of the main station. One of the main parts of the dam--the spillway--is being tested on the vacuum-cavity test bed of the integrated hydraulics laboratory. The recommendations of the scientists will make it possible for designers and builders to construct as safe a structure as possible. /Text/ /Moscow IZVESTIYA in Russian 9 Mar 84 p 1/ 8524

MOLDAVIAN GRES DEVELOPMENTS--Dnestrovsk--Moldavskaya GRES... Every year and a half the next power block is put into operation here. There are now 12 of them. The station capacity has exceeded 2.5 million kilowatts. The veterans will remember the "beginning" well. They remember when the first buildings were built in the streets of the temporary settlement and when the bulldozers paved the routes of the first roads. Recently they re-experienced the events of 20 years ago and they were carried away by the unforgettable, heroically-performed work days of the construction project. Newsreel films taken by local amateur photographers reminded them of all of this. Two power blocks, which became operational during this five-year plan, were synchronously assembled with steam and gas turbines for the first time in thecountry. The station gave life to a city whose destiny is also unusual. Everyone who visits here invariably senses a rhythm of youthfulness. Time constantly adds ever new lines to the look of the city. Many good changes have occurred here since the time of the last elections to the USSR Supreme Soviet. More than 300 families have acquired new homes. A covered market has been built. Shops and cafes have appeared. For social, cultural, and personal facilities, their own guest house was built on a bank of the Black Sea and in the settlement of Koblevo. A sanatorium-type dispensary is now being built in a picturesque corner of the Kuchurganskiy estuary. /SOVETSKAYA MOLDAVIYA correspondent L. Dmitriyev/ /Text/ /Kishinev SOVETSKAYA MOLDAVIYA in Russian 8 Feb 84 p 1/ 8524

SHULBINSK GES POWER GENERATORS--Two power indicators must be in the technical manuals of the Shulbinsk GES hydraulic generator which the association Elektrosila has begun to produce. As to filling up the reservoir of the new station on the Irtysh, only some assemblies in the electrical machinery will be replaced after which its capacity will be raised from 117,000 to 225,000 kilowatts. It is foreseen as an original power machine unit created by the association's designers. Yesterday in the enterprise's hydraulic generator shop, the machining of a stator for the prototype of such a machine began. [Article by S. Davydov] [Text] [Moscow PRAVDA in Russian 30 Mar 84 p 2] 8524

SURGUT GRES-2 CONSTRUCTION--Surgut(Tyumen Oblast) (LenTASS)--The hydraulic mechanics fulfilled the request of the Surgut GRES-2 builders with dispatch. For the first time in cold weather, the crews of dredgers headed by brigade leaders A. Ishchuk and V. Svistunov erected an artificial island, depositing on it more than 700,000 cubic meters of soil. Usually at this time of year the ice on the northern rivers and lakes is very hard and the Siberians are forced to discontinue the dredgers. However, the TETs builders required a work sector earlier than planned. Therefore, the hydraulic mechanics suggested melting the ice near GRES-1 with warm water. Using excavators, they built a 400-meter channel from this station's reservoir along which the water entered the quarries with the dredgers. They had earlier thrown powerful sludge lines over to the place of the future building site. This year the hydraulic mechanics will move a record amount of soil for the GRES-2 structure--three and a half million cubic meters. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Mar 84 p 1] 8524

NEW VERSATILE ROTOR DEVELOPED--(LenTASS)--The Metal Plant--The collective finished making a rotor for an initial unusual machine, capable of operating in the turbine and pump modes--to pump water into a high reservoir basin at night and to use it during the day to produce electric power. The 200,000 kilowatt machine is intended for the Zagorsk GAES [pumped-storage power station] under construction near Moscow. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 21 Feb 84 p 1] 8524

NERYUNGRI GRES CONSTRUCTION DEVELOPMENTS--The concreting of the second power block foundation at the Neryungri GRES has begun. At the end of last year, the GRES had supplied commercial current to projects of the Yuzhno-Yakutsk territorial and production complex. The collective of builders has decided to place the second power block under a commercial load at the end of this year. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 84 p 5] 8524

BAYPAZINSKAYA GES CONSTRUCTION DEVELOPMENTS--Dushanbe--The installation of the first hydraulic turbine has begun at the Baypazinskaya GES in Tadzhikistan. The collective of builders of the administration Nurekgesstroy [Nurek Hydroelectric Power Station Construction Administration] has pledged to turn over the water power center ahead-of-schedule. The 17-ton cone of the suction turbine was installed on a concrete foundation within the computed hours. Many of the country's industrial enterprises, with whom the Nurek people have been joined for a long time by friendly working ties, are participating in the construction of the Baypazinskaya GES. Competition according to the "worker competition" principle is successfully developing. [By SOTSIALISTICHESKAYA INDUSTRIYA correspondent P. Laptev] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Feb 84 p 1] 8524

COMPLETION OF ANDIZHANSKAYA GES--(UzTAG)--A state commission has accepted into operation the last two hydraulic units, the third and fourth ones, of the Andizhanskaya GES. The capacity of this electric power station on the Karadar'ya River is now 140,000 kilowatts. Water is now accumulating in the reservoir formed by the high dam constructed here--the size of the artificial sea is two cubic kilometers. When the passage of the water from melted snow into the river's lower flow begins, this water will rush down, rotating over the path of the blade of the four turbines, and the Andizhanskaya GES will supply commercial current to the united power system of Central Asia. However, even before construction was fully completed, the first two units of the new GES successfully generated more than 200,000 kilowatt hours of electricity. Now the in-flow of power from Sovetabad will double. Many production collectives from Russia, the Ukraine, and other fraternal republics participated in the construction of the Andishanskaya GES. The turbines came from Kharkov, the generators from Novosibirsk, the transformers converting the power from Tolyatti. Specialists from contractor enterprises have arrived here at the construction site to help in installing, adjusting, and starting up the equipment. [Text] [Tashkent PRAVDA VOSTOKA in Russian 25 Feb 84 p 4] 8524

CSO: 1822/247

PIPELINE CONSTRUCTION

BRIEFS

UZBEKISTAN TRUNK GAS PIPELINE--The Shurtan-Syr-Darya GRES-Tashkent trunk gas pipeline has been put into operation in Uzbekistan. [Video shows control room, pipe laying operations and map of pipeline route.] This is the first time in Soviet practice that sulphur-containing gas has been sent so far. Special thickened steel pipes are used. There are 35 electrochemical protection stations along the line to insure safe working and prolong service life. During pipelaying operations, topsoil was preserved and has been replaced for farming use. Among recipients of the gas are the Almalyk mining-metallurgical combine and chemical works, the Akhangaran cement works and the Tashkent GRES. [Moscow Television Service in Russian 1530 GMT 22 Jan 84 LD]

SAKHALIN-KOMSOMOLSK-ON-AMUR LINE BEGUN--Khabarovsk February 29 TASS--Work has been started in the Soviet Far East on a gas pipeline that will be 600 kilometres in length. It will link Komsomolsk-on-Amur, a major industrial centre, with gas deposits in the north of Sakhalin Island. The new line will parallel two existing oil pipelines linking the continent with the mainland. The gas pipeline will make it possible to switch the thermal power stations, the open hearth furnaces of the "Amurstal" plant and the boiler houses of almost 50 enterprises from coal and fuel oil to cheap fuel. It will also meet the household needs of the city which has a population of 300,000. Sakhalin gas will reach Komsomolsk-on-Amur in the first half of 1986. [Text] [LD011101 Moscow TASS in English 0415 GMT 29 Feb 84 LD]

CSO: 1812/225

USSR GOSPLAN DEPUTY CHAIRMAN CONSIDERS ENERGY CONSERVATION

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 5, May 84 pp 3-14

[Article by A. Lalayants, eputy hairman, USSR Gosplan, under rubric "Vitally Important Tasks of the National Economy": "Problems of Economizing Fuel and Energy Resources"]

[Text] The Soviet Union has created a mighty fuel and energy complex that assured in 1982 the production of 616 million tons of petroleum (including gas condensate; more than in any other country in the world); 36 billion cubic meters of gas, and 716 million tons of coal. The production of electrical energy came to 416 billion kilowatt-hours -- more than in West Germany, England, France, and Italy combined. Our country has created a solid technical and raw-materials base for the further accelerated development of nuclear power engineering, and has formed the country's Single Energy System, which encompasses a territory with an area of 10 million square kilometers and a population of 220 million persons.

The intensive buildup in the extraction and production of fuel and energy resources during the past two decades made it possible to achieve a considerable rise in the extent to which labor in industry is provided with energy and electricity (respectively by a factor of 2 and 1.8, during 1965-1981); and likewise in agriculture (by a factor of 3 and 7.4). There has been an increase in the role of the fuel and energy complex in our country's system of foreign-economic ties.

The development during the previous decades of the branches in the petroleum and gas industry at outstripping rates played an important role in reinforcing the economy of the Soviet Union and all the countries in the socialist community. On that basis we have achieved a considerable increase in the production of electrical energy and chemical output, have resolved the fundamental questions of the electrification and mechanization of agriculture, have carried out the complete conversion of rail transport to diesel-locomotive and electric-locomotive traction, have substantially increased the shipments by motor transport and aviation, and carried out major measures to improve the satisfying of the public's everyday needs for fuel. Currently more than 200 million inhabitants of our country use gas in their everyday life. For purposes of satisfying the growing needs of the national economy for energy resources as a result of the further deepening of the electrification of social production and everyday life, the accelerated development of the technical base of agriculture, and the

carrying out of the program of eliminating heavy physical labor, the overall volume of production of the primary fuel and energy resources will increase.

In order to achieve high levels of fuel extraction it will be necessary on an ever-increasing scale to put into operation the deposits in areas with complicated natural and climatic conditions and high expenditures for its extraction and delivery to the customers. The development of the fuel and energy branches and the means of transporting energy resources is becoming increasingly expensive and is more difficult to achieve. The capital investments in these branches in recent time have been increasing 1.5 times faster than the production levels, chiefly as a result of the tremendous expenditures for the maintaining of the already achieved level of fuel extraction. For the long-term view, the tendency of the outstripping growth of the specific expenditures for the extraction of fuel will continue to pertain. But it is not simply a matter of expenditures.

With the achieved volumes of fuel extraction, there is an intensive exhaustion of the mineral resources, especially in areas with favorable natural and geological conditions. The carrying out in tremendous volumes of the extraction, processing, transportation, and consumption of energy resources does not occur without leaving a mark on the environment, despite the various expensive measures to protect that environment.

For purposes of reducing the expenditures in the national economy to the fuel and energy branches, simultaneously with the intensive development of the extraction of fuel and the production of energy in the country there is a constant carrying out of a large amount of work to locate and implement economizing reserves and to increase the effectiveness of the use of the fuel and energy resources. By this measure, for example, in 1980 there was a saving, as compared with the 1975 level, of 92 million tons of standard fuel and, in addition, 33 million tons of standard fuel of organic fuel were replaced by electrical energy produced at nuclear and hydroelectric power stations.

With the achieved scope of the production of fuel and energy resources and the still insufficiently high level of the beneficial use, the economizing of fuel and energy is an effective alternative to the further buildup in the volumes of extraction and production. Measures for the economizing of fuel are usually one-third to one-half as expensive as the equivalent increase in the extraction and transporting of it to the customers. At the present time the economizing of energy resources by one percent reduces consumption in the national economy by approximately 18 million tons of standard fuel, which, in present-day world prices, is equivalent to 1.8-1.9 billion rubles.

As a result of the increasing economic and social importance of the economical expenditure of the fuel and energy resources, the party and the government constantly pay a large amount of attention to this question and have been carrying out in the country, on a planned basis, an active energy-saving policy. This found its expression in decisions of the 25th and 26th Congresses of the party and in a number of special decrees of the CPSU Central Committee and the USSR Council of Ministers.

The USSR energy program that was developed on their basis stipulates the conversion of the country's economy to the intensive and energy-saving path of development by carrying out a series of measures on the basis of the introduction of the achievements of scientific-technical progress.

The basic directions in the energy-saving policy include:

-- the introduction in branches of the national economy of economical generating, fuel-using, and energy-using equipment, progressive technological processes, units, and machinery that guarantee the high technical-economic level of production with the minimum expenditures of energy resources;

-- the modernization of the existing energy-generating and energy-using equipment, machines, and machinery, and the improvement of fuel modes;

-- the development of centralized heat supply by means of the construction of new TETs [heat and electric power plants] and the expansion of new ones, and large-scale rayon boiler rooms and nuclear stations for supplying heat to cities and city-type settlements, with the simultaneous elimination of small-scale boiler rooms with old equipment;

-- the expansion of the production and use of instruments and automatic systems to record, monitor, and regulate the operation of boiler units, heat systems, and the expenditure of fuel and energy;

-- the raising of the level of use of combustible and thermal secondary energy resources, the recuperation of discarded heat for its immediate application in the technological processes; the re-use of heat in the ventilation discharge from industrial enterprises and public buildings, as well as low-potential heat with the aid of heat pumps;

-- the reduction of the losses of thermal energy by increasing by a factor of 2-3 the heat-protective properties of the surrounding designs of the buildings and heat systems; the introduction of a variable mode in the heating of public and production buildings;

-- the reduction of the expenditure of petroleum products in transport, in agriculture, industry, and construction by means of increasing the efficiency of internal combustion engines, and the improvement of the entire system of transportation and the supplying of petroleum products to the national economy;

-- the economizing in the national economy of energy-intensive materials by means of replacing them with other materials and making the maximum use of secondary raw materials;

-- the development of the production of electrical and thermal energy at nuclear power stations, electrical energy at hydroelectric power stations; the assimilation of the geothermal, solar, wind, and other nontraditional types of energy for purposes of replacing organic fuel;

-- the improvement of the planning, norm establishment, and organization of the operations to emply technically substantiated norms for the expenditure of fuel and energy; the intensification of state supervision over the use of those resources; the improvement of the system of recording the consumption and the providing of material incentives for the economizing of the fuel and energy resources.

It is assumed that within the next decade the series of measures that have been planned will make it possible to guarantee a considerable reduction in the computed increase in the consumption of energy resources in our country.

In the Soviet Union the efficiency of the energy resources after losses during the extraction of fuel, conversion, and transportation of energy, constitutes approximately 43 percent, that is, is at the world level.

The absolute value of the used part of the energy potential of the already extracted fuel is equal at the present time to approximately 800 million tons of standard fuel a year. That part should not be viewed in the full volume as a real reserve for economizing, since a large part of the losses is determined by the achieved level of modern-day technology and the technological processes for the transformation, transportation, and final use of the energy resources. At the same time, in the total bulk of losses of fuel and energy resources there is also a large number of those that can and must be eliminated or substantially reduced.

In recent decades the country's economy formed under conditions of a practically unlimited satisfying of the demand for fuel and energy resources at an extremely low price. The factor of energy-intensity was by no means always taken into consideration when substantiating and selecting economic and technical decisions. That left its imprint on the structure of the national economy, the branches, and the technological processes of production, and also upon the attitude that the customers took to that question. At the present time, under the conditions of a sharp increase in the national-economic expenditures for fuel and energy, the investment and technical policy must be reorganized with a consideration of the new realistic conditions.

First of all it is necessary to assure a correlation that is effective with regard to its final results between the rates of development of the energy-intensive and the less energy-intensive branches of the national economy and industry. For the time being, according to preliminary estimates, in the 11th Five-Year Plan we are observing an increase in the total and specific energy-intensity of transport, chiefly as a result of motor transport; and a preservation of the large energy-intensity of chemistry, the fuel branches, and ferrous metallurgy. One still observes insufficient rates of development in the less energy-intensive branches of industry -- light industry, food industry, machine building, agriculture.

When planning for the longer term, one should strive to guarantee an efficient correlation in the rates of development of the individual branches; one should chiefly develop the less energy-intensive production entities that produce output that is identical with regard to consumer characteristics; one should effectively use the design materials by replacing, within the substantiated volumes, the energy-intensive metals and materials by less energy-intensive ones (plastics, glued wooden structurals, glass, and other economical materials).

A factor of substantial importance is the improvement in the siting of the country's productive forces in order to make more complete use of the local energy and raw-materials resources and thus reduce the energy expenditures for shipments of fuel and other freight, as well as bring about a reduction in the energy-intensity of production in zones with insufficient energy resources of their own. This is influenced by the fact that in the eastern parts of the

country use is made, for the purpose of producing energy, of the tremendous hydroelectric resources of the Siberian rivers, as well as the reserves of bituminous coal and brown coal, the production of which be carried out by means of the inexpensive open-cut method. The existence, in addition, of major reserves of mineral and raw-material resources, makes it possible to develop effectively in those areas the energy-intensive branches of industrial production, lowering the levels of energy consumption and the concomitant guaranteeing of the national-economic expenditures in the other parts of the country.

A factor of great importance is the further increase in the efficiency of distribution of energy resources to customers. This pertains first of all to petroleum products and natural gas. The country has a large volume of petroleum to be refined into fuel oil that contains a large quantity of light fractions and that is burned as a boiler-furnace fuel (including at electric power stations). The problem of replacing it with coal and natural gas is being resolved, for the time being, slowly by virtue of a number of reasons, including the insufficient rates of development of production of coal and nuclear power, the limited development of the gas-transporting systems, including branch pipes to industrial sites, cities, and settlements, the slow development of the processes of the thorough refinement of petroleum, the insufficient increase in the volumes of refining of natural gas and the condensate produced at the same time, and the production of compressed gas, methanol, and other products which, with sufficient effectiveness, could replace the expensive petroleum products in the use sphere.

The main condition for an active energy-conseration policy at the present-day stage is the broad introduction of the energy-saving achievements of scientific-technical progress in all branches of the national economy -- in industry and especially in the municipal and public services sector, in transportation and in agriculture.

As a result of the measures being carried out, the specific expenditures of the fuel and energy resources for the production of many types of industrial output have been steadily dropping. For example, whereas in 1945 the production of one kilowatt-hour of released electrical energy required the expenditure of 627 grams of standard fuel and in 1960 it required 471 grams, in 1980 it required 328 grams of standard fuel. The specific expenditure of fuel that has been achieved in our country for the production of electrical energy is considerably less than in such industrially developed countries as the United States, West Germany, and Great Britain, although it is somewhat higher than in France and Japan.

However, even in the energy-intensive branches of industrial production in which, traditionally, a large amount of attention is devoted to questions of the efficient use of energy resources, there are still considerable reserves.

In electrical-energy engineering the largest-scale measures for economizing energy resources are the change of the structure of the generating capacities and the production of electrical energy; the modernization of the equipment at steam-turbine electric-power stations; the setting up of means to compensate the reactive capacity for the reduction in the losses of electrical energy during transportation; the improvement of the insulation on mainline heat ducts and the reduction of losses during the transportation of thermal energy, etc.

The opportunities for, in principle, a more considerable increase in the effectiveness of the use of the fuel and energy resources for the production of electrical energy by 5-10 points as compared with the achieved 38 percent are linked with the introduction of magnetohydrodynamic (MHD) generators and steam-gas units. A promising type of MHD-generators with a capacity of 500 megawatts is being built at the Ryazan GRES, and a steam-gas unit with a unit capacity of 250 megawatts is being assimilated at the Moldavian GRES.

In ferrous metallurgy, considerable reserves for the conserving of energy resources are linked with the improvement of production techniques for pig iron by increasing the iron content in the concentrate, the increasing of the share of pellets in the iron-ore part of the charge, by raising the average temperature of blasting, by injecting coal-dust fuel into blast furnaces; with the intensification of open-hearth production and the change in the structure of steel-casting production by replacing obsolete open-hearth furnaces with oxygen convertors and electric furnaces; with the introduction of the continuous teeming of steel and a number of other measures in rolled-metal production. The continuous steel casting method, which makes it possible to reduce energy consumption in rolled-metal production, reduce dimensions of production facilities, and to increase by 10-15 percent the output of serviceable metal should be especially noted.

In nonferrous metallurgy measures that are effective ones for energy conservation are: the modernization of the equipment; the improvement of the technological processes; the change of the structure of production; and a number of other measures that make it possible to reduce the expenditure of energy resources by 10-15 percent.

The introduction of energy-conserving technological processes in the chemical industry, for example, in the production of ammonia, will make it possible to reduce the specific expenditure of electrical energy by two-sevenths.

In the building materials industry, the obtaining of a considerable saving of energy resources is linked with the conversion of the existing cement-producing enterprises from the wet method to the dry and semidry method, and with the reduction of the moistness of the slime and the modernization of the heat-exchange devices in the furnaces for the roasting of the cement clinker, and with other measures. The implementation of these measures should result in the savings of 20 percent of the boiler-furnace fuel. Therefore it is very important for the new construction, remodeling, and modernization of the existing capacities to be carried out only on the basis of the application of these progressive technological resolutions. . .

An important reserve for economizing is the raising of the level of use of the secondary energy resources, especially thermal ones. The annual production of the accounted combustible secondary energy resources in 1980 came to 36 million tons of standard fuel, of which 32.7 million tons, or 92.4 percent, were used. With a consideration of the further increase in the production of these resources, they are estimated in the 11th Five-Year Plan in the volume of 4-5 million tons of standard fuel.

The situation is more complicated with regard to the use of thermal secondary resources, the volumes of which are especially considerable in ferrous and

nonferrous metallurgy, machine building, and in the gas, petroleum-refining, petrochemical, chemical, and woodpulp-and-paper branches of industry. The level of use of the accounted thermal secondary energy resources in industry constitutes as a whole approximately 52 percent. The possible saving of the fuel and energy resources by means of the additional re-use of the thermal secondary resources in the current five-year plan is estimated to be in a volume of more than 8 million tons of standard fuel.

During the elapsed years of the 11th Five-Year Plan the assignments for the use both of the fuel resources and the thermal secondary resources were not fulfilled completely and the existing opportunities for increasing the re-use of the secondary energy resources are being used insufficiently. There are large reserves for economizing energy resources by recovering the heat in ventilation discharges. As a result of the fact that much here depends upon the degree of provision with the appropriate equipment, in the current five-year plan it is planned to organize the production of new types of heat recovery equipment for the ventilation system in industrial and public buildings and facilities, including rotating and plate-type recovery units with heat tubes, recovery units with intermediate heat carriers, etc. The necessary changes are being made in the construction and technological norms and rules for the designing and construction of industrial and public buildings and structures, in order to provide a broad implementation of heat recovery equipment in the ventilation and heating systems.

The USSR ministries and departments and the Councils of Ministers of the union republics have been given the task of carrying out measures to use the heat in ventilation discharges, in order to guarantee the reduction in the expenditure of thermal energy for the ventilation of industrial and public buildings and structures by no less than 50 percent as compared with the norms that are in effect.

Questions that deserve special attention that the questions of the expenditure of fuel and energy in the municipal and everyday sector, the share of which is approximately 20 percent of the energy resources being consumed in the country. The task consists in assuring that the steady improvement in the municipal and everyday conditions is provided not only by means of the direct increase in the volumes of the energy resources being channeled into that sector, but also by the simultaneous reduction of losses and by more efficient use. For a long period of time the proper attention has not been devoted here to questions of the efficient consumption of fuel and energy. During 1965-1980 the specific expenditures of heat in housing and in public and industrial buildings and structures increased by almost 1.5 times. A large amount of heat is lost because of the inability to regulate the heating and ventilation, and also is ejected into the atmosphere through the ventilation ducts of housing and public buildings with recuperation of the heat. Inadmissibly high expenditures of electrical energy occur because of the inefficient illumination of housing and public and trade buildings during the nighttime and due to the high energy-intensity of household appliances.

Another problem that requires resolution is the problem of the centralization of heat supply. At the present time our country operates 280,000 boiler rooms, including more than 180,000 small-scale ones with a capacity of less than 20 gigacalories/hour, with specific expenditures of fuel of 220-230 kilogram/

gigacalories, as compared with 173 kilogram/gigacalories in large-scale boiler rooms. In the elimination of the small-scale, uneconomicaly boiler rooms lies both a large reserve for the economizing of fuel, and the reduction in the number of the service personnel, the size of which group can be reduced by one million persons.

A factor that will be of substantial importance in the resolution of this problem is the fulfillment of the measures that are aimed at increasing the effectiveness of the thermal-energy management in the cities and other populated places in our country.

The problem of the economizing of liquid fuel is especially substantial. In the near future, a further increase in the consumption of motor fuel is anticipated, which is influenced, on one hand, by the increase in the volume of transportation work, and, on the other, with the insufficient volume of introduction of energy-conserving measures. In the 11th Five-Year Plan our country is carrying out a series of measures to economize fuel and energy resources in transportation by increasing the share of freight shipments via diesel-engine motor vehicles, and the reduction of the fuel expenditure norms for transportation work as a result of the delivery of more economical motor vehicles, the improvement of the transportation process, the building of new highways and the improvement of the existing ones, etc.

In order to guarantee the fulfillment of the established assignments it is necessary to accelerate the work of assimilating the production of diesel-engine motor vehicles in such large-scale production associations as ZIL and GAZ.

A considerable economizing of motor fuel must be obtained in air transport as a result of the increase in the aircraft load capacity, the increase in the efficiency of the engines, and the improvement of the operational modes -- increase in work load, and the introduction of optimal flight speeds.

The reserves for economizing fuel in transportation by means of the implementation of the achievements of scientific-technical progress in the long view are estimated to be 32-36 percent of the consumption at the present time.

Rather large opportunities and reserves for the further increase in the energy effectiveness of the basic types of operations exist in agriculture. The use of the flat-cutting cultivation of the soil and machines that simultaneously carry out several technological operations; the chemical preservation of the moist grain; active ventilation; the preventive heating of the drying agent for the drying of grain; the preliminary sun-drying and partial drying of the green mass of fodder crops; and of other energy-saving measures will make it possible to reduce the compute need for diesel fuel by 11 percent of the expected amount in 1985.

By creating and introducing equipment for the automatic regulation of the process of drying and recirculation of the heat-bearer, the expenditure of fuel will drop by 8-10 percent.

In order to achieve the planned volumes of economizing of fuel and energy it is necessary to accelerate the production of technology for the anti-erosion

treatment of the soil and for the broad use of progressive technological processes for the cultivation of industrial and fodder crops. Special attention must be devoted to the creation of a broader network -- supplied with spare parts -- of centralized and mobile shops, to the construction of petroleum warehouse facilities, and to the installation of reservoirs of the necessary capacity, and to the creation, especially in rural areas, of a well-extended network of motor-vehicle refueling stations.

Reserves for increasing the effectiveness of the use of motor fuels in transportation and in agriculture at the 1985 level are estimated in the amount of 6-8 percent of consumption.

One of the promising directions for reducing the need for light petroleum products is the replacement of them by other types of fuel: by liquefied and compressed gas, methanol, and synthetic petroleum. With the purpose of organizing the operations of providing for the replacement of gasoline and diesel fuel, steps have been planned to expand the resources of motor fuels for internal combustion engines. As a result of the implementation of the planned measures, it may be possible by 1985 to replace some of the motor fuels.

The basic directions in the economic and social development of the USSR in 1981-1985 and for the period until 1990 stipulate the reduction of the consumption of petroleum and petroleum products as boiler-furnace fuel, the reduction of the consumption of fuel oil as boiler-furnace fuel by replacing it by natural gas. The scope of the reduction of fuel oil consumption by industrial and rayon boiler rooms is determined both by the availability of gas pipelines and by the availably of gas storage facilities, especially for supplying gas during the wintertime.

Within the next few years the need for fuel oil for the production of electrical and thermal energy will be reduced by increasing the consumption of natural gas. In the long view the consumption of fuel oil by thermal stations and by industrial and rayon boiler rooms in the country will be reduced to almost one-half as compared with the level of its consumption in 1980.

An important part of the energy-conservation program is the implementation of measures that are aimed at the reduction of the direct losses of fuel and energy at the stages of extraction and production, transportation, storage, and use. For example, at the present time, with the existing methods of extraction of petroleum, some of it remains in the ground. The experience that has been accumulated in our country and abroad indicates that, by means of the improvement of the technological processes for the extraction of petroleum, with the application of new thermal, chemical, and other methods of bed stimulation. it is possible to increase the petroleum extraction considerably and obtain annually 40-50 million tons of additional resources of petroleum. By increasing the gas coefficient of the gas production of the seams from 0.85 to 0.9, reducing the operational losses, using low-pressure gas, and carrying out a number of other measures, there can be a substantial reduction in the expenditures of natural gas for the gas industry's own needs.

It is possible to achieve a further rise in the level of the use of associated gas, and to bring it, on the average for the country, to 90 percent or more. This will make it possible to obtain an additional fuel resource in a volume of more than 11-15 billion cubic meters.

A concomitant fuel and energy component when mining coal is the gas methane. Reserves of methane are considerable in the Donetsk, Kuznetsk, and other coal fields. The level of methane use in our country is, for the time being, completely inadequate, and that level must be sharply increased. Methane should be viewed as a fuel and energy resource that can be produced simultaneously with coal, and, correspondingly, complete use must be made of it when mining coal; the necessary measures for this purpose must be stipulated during the construction, remodeling, and modernization of the mine fund of the USSR Ministry of the Coal Industry.

By reducing the losses of coal during rail shipments it is planned to save 6-7 million tons of high-grade coal. For this purpose it is necessary to organize better the repair of the railroad cars being supplied to be loaded, and also to guarantee the leveling off and solid packing when loading the surface layer of coal in the railroad cars, and the application to it of a protective film covering (a water and fuel oil, or water, fuel oil, and oil emulsion).

Under conditions of the intensification of the work of gas pipelines, there has been an increase in the expenditure of gas for the gas pipelines' own needs. The use of electric drives on the new gas mains that run through areas where powerful unified energy systems operate, their replacement with gas-turbine drives on the existing gas pipelines, and the improvement in gas use efficiency at large-scale GPA's [gas pipeline administrations] will make it possible to free up a considerable amount of natural gas for the national economy, including the more than 10-12 billion cubic meters per year that are computed overall.

Considerable reserves for the economizing of energy resources are contained in the reduction of the expenditures and losses of energy-consuming output, especially metal, building materials, etc.

The plan for the 11th Five-Year Plan stipulated the economizing of rolled ferrous metals in machine building and metal processing in the amount of 8.5 million tons; in capital construction, 2.1 million tons; and cement, 7 million tons.

An important reserve for the economizing of energy resources is the repeated use in industrial production of secondary raw materials: scrap metal, waste paper, used petroleum products, and other types of waste materials.

For the national economy as a whole, the reserves for economizing by the involvement of secondary raw materials in the established products list alone are estimated at 10-12 million tons of standard fuel.

In the 11th Five-Year Plan work that will receive further development is the work of replacing organic fuel with nuclear fuel and with renewable types of energy, among which hydroenergy occupies a leading place, being a traditionally highly organized subbranch of electrical energy engineering. Thus, the production of electrical energy at nuclear electric-power stations in 1985 is supposed to exceed the 1980 level by 3 times, and at hydroelectric power stations, by 20-25 percent.

On the whole, as a result of the development of the production of electrical energy at nuclear and hydroelectric power stations, it is planned to free up a considerable quantity of organic fuel. A substantial contribution to the resolution of this task can be made during the period after 1985 by the use of the heat from nuclear TETs and heat-supply stations.

A considerable amount of attention is being devoted to involving in economic use the nontraditional sources of energy (geothermal, solar, wind), and also to the obtaining of biogas from waste products of agricultural production. Recently a number of measures have been developed which are aimed at the acceleration of the involvement in the national economy of renewable sources of energy. However, the overall contribution of them, as yet, constitutes less than 0.2 percent.

It is necessary to disseminate more broadly the experience of operating more than 20 projects with solar heat-supply systems, including the 215-person Sportivnaya Hotel in Simferopol, the 320-person boarding house in the settlement of Rybachye, Crimean Oblast, and four-story 32-apartment houses in the cities of Chirchik, Tashkent, Fergana, and Bukhara, which will make it possible to save 120-150 tons of standard fuel per year per square meter of solar collectors and as much as 500 tons of standard fuel per year from each hectare of helio hothouses.

Experience that deserves attention is the experience in the comprehensive use of the geothermal water in the settlement of Mostovskaya, Krasnodar Kray. Work is being carried out successfully to provide for reverse pumping of water at the Khankal'skoye deposit of thermal waters in Chechen-Ingush ASSR. The use of formation pressure maintenance techniques, and pump recovery of geothermal energy sources provides an opportunity to replace in the long run a considerable quantity of organic fuel.

The use of wind units to raise water for pastures, to charge storage batteries, and to provide power for electrical household appliances makes it possible to save as much as 2 tons of liquid fuel per year per kilowatt of installed capacity.

A special problem is the use in the national economy of biomass, and agricultural waste products in particular. Methane fermenting technology makes it possible to create an economically closed system with the obtaining of biogas and high-grade fertilizers with a complete content of nitrogen and phosphorus. According to estimates by specialists, the application of biogas will make it possible to replace, in the long run, many millions of tons of standard fuel a year.

The involvement of new types of energy resources will expand the raw-materials base of energy engineering and will reduce the load placed on transportation. They are viewed as an additional source for replacing organic fuel, a source which, in the optimal combination with the traditional energy resources, can play a noticeable role in our country's energy balance, especially in agriculture.

A factor that is taking on great importance at the present-day stage is the construction of plants and enterprises that produce in the necessary quantities

and assortment various kinds of energy-economical equipment, apparatus, and devices for the carrying out of time-responsive accounting and monitoring of the expenditure of energy resources in the production and nonproduction spheres.

The increase in the scope, depth, and interrelationships among the energy-conserving measures in the national economy objectively influences the need for taking a target-type, comprehensive approach to their elaboration and implementation. The chief stage is long-term planning, in the process of which there is a determination of the energy-conserving directions and measures, and a resolution of the basic questions of financial and material-technical support.

In practice, the target-program method of planning the economy is finding greater and greater application. For this purpose the following have been developed: a comprehensive target program for the economizing of energy resources on the scale of the country's national economy for 1981-1985 and for the period until 1990; a program for the economizing of fuel and energy in the housing and municipal management; and programs for the economizing of energy resources in agriculture, in transportation, and in a number of other directions.

There is a need for improvement in the planning of the use of fuel and energy resources both at the level of the ministries, union republics, oblasts, and assocations, and especially enterprises, that is, wherever the bulk of the economizing of the energy resources is directly formed. The USSR ministries and departments and the Councils of Ministers of the union republics should make it a broader practice to prepare fuel and energy balance sheets for enterprises both when designing new enterprises and ones that are to be remodeled, and at operating enterprises. Provision must be made at such time for measures to achieve the most effective use of the fuel and energy resources.

An important condition for the effective planned administration of the economizing of energy resources is the guaranteeing of its progressive normative base, which is directed at the resolution of the planning tasks. However, there are a number of questions that need immediate resolution. In particular, it is necessary to raise the level of substantiation of the expenditure norms for fuel and energy and to expand their circle by types of energy resources and directions of fuel and energy consumption, and to improve the informational base, cadre composition, and organization of norm work. It will be necessary to provide for norms on a broader basis for agriculture, municipal and public utilities and to improve controls for energy consumption rates at ministries, departments and at enterprises.

Questions of providing an incentive for the economizing of fuel and energy resources require resolution. Recently a number of corresponding steps have been taken. For example, at the present time as much as 90 percent of the value of the economized fuel and energy remains at the disposal of the production associations (enterprises). As much as 75 percent of the value of the economized energy resources can be allocated for the payment of bonuses. Simultaneously there has been an expansion of the economic sanctions for the overexpenditure of fuel and energy.

The effectiveness of the planning, norm establishment, and encouragement of the economizing of energy resources depends to a greater degree upon the condition of the accounting and monitoring of their use, and primarily upon instrument accounting and monitoring everywhere. Therefore the ministries and the union republics must organize the strict accounting of the expenditure of energy -- electrical and thermal -- as well as petroleum products in all sectors of the national economy according to the appropriate instruments.

The energy-intensity required for identical output or type of operations at various enterprises is considerably different. At several of them, the levels of energy-intensity are below the analogous indicators that were achieved at the advanced domestic and foreign enterprises.

In order to regulate the maximum levels of energy-intensity during the production of individual types of output and operations, and also, as a whole, the energy intensity of social production and its individual branches, within the confines of the implementation of the program for the economizing of energy resources a large amount of work is being carried out in accordance with a program that was developed in 1982 by Gosstandart [State Committee for Standards] -- the Program for Technical-Norm and Metrological Support for Increasing the Effectiveness of the Use of Fuel and Energy Resources in 1982-1990.

For purposes of increasing the activity rate and increasing the practical effectiveness of the operations to economize energy resources, it would apparently by desirable to create in the ministries and departments, especially in the energy-intensive ones, specialized organizations organized on the principle of cost accountability, which carry out the design, installation, adjustment, and turnover for operation of energy-saving equipment, units, and systems for accounting for and regulating the expenditure of fuel and energy resources, as certain administrations (organizations) in USSR Minchermet [Ministry of Ferrous Metallurgy] are beginning to do.

As a result of the increasing fuel and energy flows, a task that is becoming an increasingly vital one in our country is the task of reducing the losses during the transportation of fuel and the transmittal of energy to great distances and the reduction of the resultant large-scale national-economic expenditures. An important condition at such time is the comprehensive resolution of the problems being advanced by science.

A factor of decisive importance for the economizing of organic fuel is the further development of nuclear energy engineering, the increasing of its effectiveness, and the expansion of its area of application. It is necessary here to resolve a series of scientific and design questions, including the expansion of the use of nuclear energy for the production of thermal energy; the combining of AES [nuclear power stations] with metallurgical, chemical, and other energy-intensive production entities with the purpose of guaranteeing the effective operational mode of the AES during periods between peak loads and the efficient use of the energy obtained at such time; the improvement of the fuel cycle with the application of fast-neutron reactors and, finally, for the more remote prospect, the creation of large-capacity thermonuclear reactors.

Until the present time our departmental institutes and the economic institutes of USSR Gosplan and USSR Academy of Sciences have been devoting insufficient

attention to the research and development of the economic problems of the economizing of fuel and energy resources. For some reasons they all remain in the shadows, but there are a large number of problems here. We are in extreme need of profound, comprehensive research on the economy of the country and the economic regions with regard to the factor of the energy-intensity of social production and, correspondingly, recommendations for increasing the efficiency of the branch and territorial structure of the national economy and its branches. It would be desirable to intensify the work with regard to the improvement of the mechanism of prices and various incentives as factors for increasing the effectiveness of the use of fuel and energy resources, which has great importance. There is a need for the further development of the socioeconomic problems of establishing norms for the expenditure of the fuel and energy resources and the questions of administering the economizing of fuel and energy in the national economy and its branches.

At the present time people are engaging actively throughout the world in the economizing of fuel and energy. The effective use and intensification of the cooperation with other countries in this area, of course, primarily with the countries in the socialist community, on the basis of the international division of labor and the forming of cooperatives to develop and introduce new energy-saving technical and technological resolutions, is one of the most important tasks of carrying out the policy of economizing the fuel and energy resources at the given stage. The basis for cooperation with the socialist countries must be the program that has been adopted and is being implemented: the Long-Term Target Program for Cooperation to Guarantee the Economically Substantiated Needs of the CEMA Member Countries for the Basic Types of Energy, Fuel, and Raw Materials for the Period Until 1990.

The State Plan for the Economic and Social Development of the USSR for the 11th Five-Year Plan stipulates the guaranteeing of the economizing of fuel and energy resources in 1985 in the amount of more than 200 million tons of standard fuel, as compared with the 1980 level.

The energy-saving measures that have been developed in our country can guarantee not only the planned levels of economizing of the energy resources in the 11th Five-Year Plan, but also their overfulfillment. In order to fulfill the established assignments for the economizing of the fuel and energy resources on the part of the ministries, departments, and union republics additional measures of the most energetic nature must be taken.

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ENERGY CONSERVATION

DEPUTY USSR POWER MINISTER DISCUSSES FUTURE ENERGY SOURCES

Riga SOVETSKAYA LATVIYA in Russian 15 Feb 84 p 4

[Interview with Aleksey Naumovich Makukhin, first deputy USSR minister of power and electrification, by S. Borisova (APN [Novosti Press Agency]): "Power Engineering Steps into the Future"]

> [Text] First Deputy USSR Minister of Power and Electrification Aleksey Naumovich Makukhin tells in a conversation with an APN correspondent about certain aspects of realization of the Energy Program and about the use of nontraditional energy sources in power engineering.

The importance of the Energy Program to the national economy is difficult to overestimate: it is called upon to execute a structural, technical, economic and organizational restructuring of the economy, to convert it to an intensive energy-saving path of development.

Our economy, as is well known, is based upon its own fuel and power resources. However, the extraction of fuel is becoming increasingly expensive--for its sources are being shifted increasingly farther to the country's east. In so doing, the generation of electricity becomes increasingly costly, and natural resources are being gradually depleted. We do not have the right to count on the generosity of the earth's interior any farther, and that means that our attitudes toward fuel must be examined radically.

Right now four-fifths of all electric power is generated by thermal electric-power stations. They consume more than half of all the coal, oil and gas that is recovered. Isn't this extravagant? The Energy Program right away called for a restructuring of the fuel and power balance through an accelerated development of nuclear power and the use of nontraditional energy sources.

Already nuclear electric-power stations (AES's) are supplying more than 7 percent of all the electricity produced in the country, which is as much as can be obtained from 30 million tons of gas, coal and mazut. During the 11th Five-Year Plan, the generation of electricity at AES's will triple. A million-kW power unit at the Kalininskaya AES and the world's largest nuclear reactor, with a capacity of 1½ million kW, at the Ignalinskaya AES, are being readied for startup. Construction of the Kurskaya, Chernobyl'skaya and Yuzhno-Ukrainskaya AES's and some other stations continues, and the erection of new stations has started.

Nuclear power has also taken upon itself concern for the heat supply of large cities. Nuclear boilerhouses are already being erected in Voronezh and Gorkiy. The first nuclear heat and electric-power centrals are being built in Odessa and Minsk.

I would like to dwell in somewhat greater detail on the use of hydropower--the best-mastered type of renewable energy. We have already reached the goal of generating electricity at GES's in the amount of 200 billion kWh per year. However, the potential is still far from having been exhausted--for only 20 percent of the economically effective hydropower resources have been developed. The potential of the rivers of Siberia, the Arctic and the Far East are not being used intensively enough--only about one-third of them are used. There is much to be done here by our power engineers.

We are placing great hopes in the further development of the hydropower resources of the Angara-Yenisey cascade. During the current five-year plan the construction of one of the world's largest GES's--the Sayano-Shushenskaya--will be basically completed. Its design capacity is 6.4 million kW.

Simultaneously, our hydropower engineers are mastering a new, effective direction: the creation of pumped-storage stations. The energy of large rivers is not required for their operation. Right now we are building two such stations--the Zagorsk, near Moscow, and the Kayshyadorskaya in Lithuania.

In all, by the end of the current five-year plan, the country's hydroelectric-power capacity should be increased by more than 12 million kW.

In recent years the necessity for industrial use of the energy of the earth's interior, the sun, the wind and sea tides has become increasingly persistent. This will enable the planet's thermal balance to be preserved and scarce fossil fuel to be consumed more economically.

Geothermal water also promises great fuel savings. Its use is especially promising for some regions of the country's European region, where a fuel shortage is being felt. For example, it is planned to erect a GeoTES [geothermal electric-power station] with a so-called underground circulation system in Stavropolskiy Kray and the Dagestan ASSR. Great reserves of geothermal energy are available in the Far East, especially Kamchatka.

Right now the use of tidal energy is becoming increasingly realistic. On the Kola Peninsula, close to Murmansk, the experimental Kislogubskaya Tidal Electric-Power Station (PES) has been operating for more than 10 years now.

But the energy of the tides is an extremely capricious matter, its magnitude fluctuates considerably during the day. Therefore, the erection of such stations can be undertaken only when all the possible ecological consequences of building them have been studied, and power customers who are capable of accepting the large capacity of tidal electric-power stations, which change during the day, have been created.

Our scientists and designers are not bypassing "the great power of the wind." The potential of windpower is enormous--it exceeds severalfold the power resources of the rivers. At the same time, large-scale use of wind energy is a

complicated matter, because of the scattering of the wind over a vast area and its uneven, spasmodic nature. Our specialists have developed a design for a windpower electric-power stations (VES) with a capacity of up to 6,000 kW. Right now sites that are most desirable for setting up the first experimental VES are being selected, and various economic indicators are being refined. It is possible that in a future five-year plan industrial test wind electric-power stations of up to 20,000 kW will be put into operation.

I want to emphasize that mastery of controlled thermonuclear fusion should be considered the main scientific and technical task of this century in the energy area. The first experimental installation, "Tokamak-10," has been designed and assembled by us in our country. It has received international recognition by specialists. According to our forecasts, the first experimental electric-power station with a thermonuclear reactor will appear at the start of the next century. This will be the global solution of the power problem: for fuel for thermonuclear installations is extracted from ordinary water.

Time will tell what nontraditional sources of energy will contribute to the country's fuel and power balance. But the base of power engineering of the future has already been laid now.

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ENERGY CONSERVATION

FRUNZE ENTERPRISES REBUKED FOR POOR SAVINGS OF ELECTRICITY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Mar 84 p 2

[Article by P. Laptev (Frunze): "The Savings Are Inside Out"]

> [Text] The Frunze City Party Committee Buro discussed a letter that was published in SOTSIALISTICHESKAYA INDUSTRIYA.
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> L. Putilov, chief of the Kirgizglavenergo [Kirghiz Main Administration for Regional Power Systems Management] energonadzor [power inspectorate], raised sharply in a letter to the editor the need to make the savings campaign more rigorous, to put order into the consumption of electricity at enterprises in the Kirghiz capital.
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> At the editorial board's request, the Frunze City Party Committee Buro reviewed this letter, after first checking the utilization of electricity at some of the city's enterprises.

This talk was strict and demanding. It was provoked by party concern not only about saving energy but first of all about indoctrinating people in thriftiness and in increasing the responsibility of personnel.

At first glance there's apparently nothing to be concerned about: according to the statistical data for last year, the republic's capital saved more than 30 million kWh of electricity. But the report about this did not delight buro members: the papers of the check indicated that much wastefulness was concealed by the externally favorable picture.

Here are the facts. The report mentions for the Krasnyy Stroitel' Plant, which is subordinate to the republic's Ministry of Building Materials, a substantial saving against the specific norms for consuming electricity, for which it is proposed that the enterprise be praised and paid a bonus. But yet last year power-inspection organs imposed 11,000 rubles in fines on this enterprise for repeatedly exceeding the ceilings on electrical consumption. K. Turdukulov, the enterprise's chief engineer, who was called to account, even here at the City Committee Buro tried to substitute a critical analysis of the situation, with references to objective causes.

"We know that there are difficulties at the plant," First Secretary of the City Party Committee K. Moldobayev remarked. "But instead of eliminating the bottlenecks with energy and initiative, you varnish the situation with imaginary savings. This varnishing, which comes to you so easily, does not do a thing. You have not lifted a finger to provide a real saving!"

The bases for such a harsh rebuke were indisputable. Last year, out of 69 items of the plant's plan for organizational and technical measures to provide for a saving of electricity, not one had been marked "fulfilled" on the chart. And most of the instructions of the power-inspection service remain unfulfilled (even though backed up by fines, but out of the state's pocket) in regard to repair of the cable activity, adjustment of electrically-driven equipment, observance of specified furnace temperatures, and elimination of other sources of losses. Given such wastefulness, when responsible workers refer to the matter with words from the bottom of the heart but in actuality do not "put their hands to it," not even the high-capacity Toktogul'skaya GES will be able to patch up all the holes, it was said at the City Committee Buro meeting.

Much the same picture was found at a number of other enterprises. At the machinery repair plant of VPO Soyuzmyasomoltar, for example, it was decided to conduct surprise inspections twice, with an interval sufficient for the people to successfully overcome the easily eliminated deficiencies. But it turned out that after the first inspection the enterprise supervisors sighed with relief and...did nothing: the surprise inspection brigade established on the second occasion that many luminaires burned unnecessarily and equipment operated without a load in the plant's departments, especially during the night shift. Indeed, no special expenses are needed to eliminate these losses, nothing except discipline, order and a sense of responsibility.

When plant director G. Yerokhin was asked whether he visits the departments during the night shift, he answered without hesitation: "But of course!" Buro members remarked to him, correctly, that the price for such evening excursions by the director were not worth anything if he saw nothing, heard nothing and took no action during them.

And then a factor of no little importance surfaced: it turned out that many enterprises consume power without recording and analysis. Ninety-three enterprises of the city must install about 2,000 electric meters and almost 4,000 transformers, and replace 190 kilometers of cable--only in so doing will it be possible to talk about actual reporting and a real drive to save.

The City Committee Buro made serious complaints also about the power inspection service. During the meeting, deputy chief of Kirgizglavenergo, Zh. Tuleberdiyev, and power-inspection supervisor A. Glotov cited extremely conspicuous cases of wastefulness that his service had found. But, as the Buro noted, the power-inspection service, when it discovered waste, did not use its rights and authority sufficiently to get the losses eliminated, to get the setting of norms substantiated, to make the consumption norms for electricity conform to the ceilings, and to get a strict accounting for consumption.

The City Party Buro imposed party sanctions on the directors of the Krasnyy Stroitel' Plant and the instrumentmaking plant--A. Tuchkov and V. Ugarov, supervisors of Kirgiztorgmash Association and the breadbaking association--A. Musabekov and K. Sherimkulov, and others who were directly guilty of serious deficiencies in the job of implementing the drive to save fuel and power resources. It was proposed that the supervisory communists of the republic's Gossnab provide enterprises with everything necessary for organizing recording of the consumption of electricity and elimination of nonproductive losses thereof and that the communists of the power-inspection services make monitoring more rigid and insure unswerving execution of their instructions. It was proposed that party committees and buros of the city's enterprises and organizations analyze the situation carefully at their production facilities and, with all devotion to party principles, examine the results of the analysis, mobilize communists and working collectives for a decisive and active struggle for the savings drive, and eliminate fully the sources and causes of the losses, requiring strict responsibility of economic supervisors and specialists for the integrated and effective solution of this task.

Not so much the strictness of the expressions as the nature of the discussions was basically important. A gap between the word and the deed is intolerable. Today, as CPSU Central Committee General Secretary Comrade K. U. Chernenko pointed out, "It is especially important to render support to specific matters and to achieve real and meaningful results. It is precisely in these matters that the maturity of supervisory personnel, the work of the laboring collectives, and the achievements of republics, oblasts and all branches of our country's economy will be evaluated."

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DYMSHITS COMMENTS ON ENERGY PROBLEMS, INTERNATIONAL COOPERATION

Moscow FOREIGN TRADE in English No 5, May 84 pp 2-8

["Abridged text" of speech by V. E. Dymshits, deputy chairman of the Council of Ministers of the USSR, on 23 December 1983, at a meeting with heads of foreign diplomatic representations accredited in the USSR]

[Text]

Energy resources have played and will continue to play a decisive role in the development of human society and its activities. Only adequate production and supplies of fuel, thermal and electrical energy can secure today technical progress in all spheres of human activity and the meeting of man's vital needs. Without the continued growth of the power and fuel industries there can be no further industrial expansion, technical re-equipment of agriculture, household, of all spheres of human activities.

Today the world produces and consumes over 9,000 million tons of equivalent fuel every year. Power engineering has reached unprecedented heights. Electricity production and consumption approximate 9,000,000 million kWh per annum and these volumes are expected to increase in the future.

Fuel and electricity consumption varies from region to region, from country to country. In industrial countries energy consumption per capita exceeds many times that of the developing nations—a fact of special importance for mankind because it implies that the consumption of all kinds of energy will go on increasing for many a decade to come as the former colonial and underdeveloped countries forge ahead, the industrial nations will also require more fuel and energy.

There was a time when it seemed the traditional fuel resources were inexhaustible. Then it was noticed that the growth rates of prospected resources

lagged behind the rates of fuel extraction.

Pessimists and "theoreticians" there claimed that our earthly civilization would be plagued by a shortage of fuels. However, thorough research into the energy supply problems has revealed that despite their complexity they can be solved, firstly, because there is still a good deal of unresearched places on the world map and, consequently, unprospected resources, and, secondly, owing to the discovery of new powerful sources of energy, for example, atomic which is extensively used for peaceful purposes. The thermo-nuclear energy provides an almost inexhaustible source.

Moreover, world energy supplies can be considerably increased through the use of renewable sources of energy such as solar, wind, geothermal, tides, etc. Many experts feel that these energy resources are vast and will be utilized much more in the near future.

As extraction of fuel and the transportation of it continue to become costlier and energy transformation processes more sophisticated, an intensive search has been underway for various, more economical uses of these resources. Still, the development and exploitation of fuel and energy resources bring vital and pressing challenges needing continually increasing labour inputs, capital investments, research and the introduction of new technologies.

These problems were thoroughly reviewed at the 12th Congress of the World Energy Conference in New Delhi last September which over 3,000 scientists, energy experts and economists from many countries attended. The Congress analyzed the progress in this field and made an interesting forecast of the world's fuel and energy resources development.

According to the estimates of the Congress the relative share of oil in the world fuel balance has dropped in the past decade from 43 to 37 per cent.

There is no doubt that the relative share of oil in the world energy consumption will gradually decrease, and that of coal, gas and atomic energy will be greater.

It may be presumed that the major change in the energy production pattern in the next 20 to 30 years will be accelerated development of the atomic and

coal industries. Oil will continue for many a decade to be a primary material for the production of chemicals and motor fuels.

The meeting of social needs in fuel and energy depends not only on the produced volume of these materials, but also on how rationally and economically they are used.

The experience indicates that the outlays on measures to economize on fuel-energy resources cost two to three times less than would be necessary to produce the corresponding increment of their production.

Experts estimate that comprehensive energy economy and saving can reduce the total energy intensiveness of manufactured products about 30 per cent by the year 2000, while cuts in fuel consumption for heating houses can be even more drastic due to their better structural design and equipment.

There are important reserves for saving energy in such power intensive industries as iron and steel, chemical, construction materials, agriculture and transport and in electricity production. A fuller use of secondary energy resources is another important area for saving fuels.

The Soviet Union and many countries have accumulated a good deal of fuel economy and energy saving know-how. Making broader cooperation of all nations in the development and use of energy saving techniques and equipment is beneficial to all.

* * *

The Soviet Union is the only industrial nation in the world to fully meet its energy requirements from its own resources. It ranks first in the world in oil production, and second in the production of coal, natural gas and electricity. Soon our country is expected to hit the highest world mark in gas production as well.

Prior to the 1917 Revolution Russia annually produced 48 million tons of equivalent fuel. In 1940 its fuel production rose to 238 million tons and in 1982 it skyrocketed to almost 2,000 million tons. Within a very short time a unique fuel base (coal, oil and gas) was developed in the eastern areas of the country. This assures the Soviet Union's steady economic growth and that of the CMEA member-countries to a certain degree as well.

Measures are being taken in our country now to intensify economic growth and scientific and technological progress. The national economy is making a steady headway; the efficiency of social production is increasing. In 1983 the national income went up 3.1 per cent and industrial production 4.0 per cent.

A few words about individual sectors in the fuel-energy complex.

Coal Industry. "Coal is veritable bread of industry...," said Lenin at the Ist (Industrial) All-Russia Congress of Mine Workers. [1]

During the years of Soviet government the coal industry has been expanded into one of the largest national economic sectors which fully meets the country's requirements for solid fuel. Prior to the 1917 Revolution Russia extracted 29 million tons of coal per annum. Today its yearly coal production exceeds 700 million tons. Coal is mined in many parts of the country: the Donetsk basin, the Ukraine, the central and northern regions, the Kuznetsk basin and now, increasingly, Eastern Siberia.

Powerful fuel and energy complexes such as Ekibastuz, Kansk-Achinsk and the South Yakutian are being developed in the eastern districts.

Facilities for the comprehensive mechanization of coal mining were developed in the Soviet Union much earlier than in Western Europe. Mechanisms now replace the heavy manual work and create much safer working conditions at the coal breakage faces. They account for over 70 per cent of underground extraction.

Underground transport at coal mines is in the main mechanized and automatized. Use is made of computers and accident warning systems (coal and rock outbursts and gas blow-outs).

We have vast resources of coal that can be extracted by open-cast mining, the most effective and cheapest method. About 40 per cent of our coal is today extracted this way. This percentage is to be increased.

Highly concentrated production is characteristic of our open-cast collieries. For example, the Bogatyr open-cast colliery in the Kazakh Republic extracts 50 million tons of coal per annum.

Coal output in Siberia and Central Asia is rising at fast rates. Soviet industry is manufacturing powerful rotary bucket excavators and complexes with ca-

pacities up to 5,000 cu.m per hour for the mining of coal.

It is indeed a thrilling sight to watch them scooping coal from a 30 metre-high face and loading it at a rate of 5,000 tons per hour on railway wagons by their own transporting system.

Siberian coal mines use excavators (made at the Urals Machine-Building Works) with a 100 cu.m bucket and a 100-metre jib. The bucket is large enough to contain a huge dump-truck or a hundred men at least. The mines use dump-trucks and coal carriers of up to 180-ton capacity, drilling rigs and other highly productive mining equipment.

Soviet scientists forecast a considerable rise of coal output at the unique Kansk-Achinsk field. Because of its low ash content the coal extracted from this largest basin is especially suitable for electric power stations and, in the future, as raw material for liquified fuel. Belt conveyers will be used for delivering coal directly from the faces to the power stations.

The South-Yakutian coal complex, a compensation project with Japanese companies supplying the equipment, is being developed in a rigorous climatic zone with frosts down to -50°C in winter. It has already started putting out coal.

The Soviet Union cooperates in coal mining with the following producer countries: Poland, the GDR, Hungary, Czechoslovakia, Bulgaria, Vietnam, Romania, with the firms in Great Britain, France, the FRG, and also with India, Iran, Mozambique, etc.

With the technical assistance of the Soviet Union dozens of coal mines and pits, dressing factories, repair and other facilities have gone into operation in foreign countries.

Opportunities for extending the mutually profitable cooperation in the coal mining industry are ample. Cooperation is especially expedient and beneficial in the manufacture of coal-mining machinery, in modernizing coal-field development systems, and mechanization and automation of the production processes in mines and open-cast collieries.

It ought to be borne in mind that in many countries the coal seams are extracted in complicated mining and geological conditions. Sometimes the seams are no thicker than 70-80 cm. They have to be worked at depths down to 1,000 metres, some of them are prone to coal and rock outbursts and gas

blow-outs which need special safety measures.

Greater international cooperation would benefit the development of extra safety measures at mines such as automatic devices to prevent gas accumulations and prevent other mining hazards. Positive results could be achieved by expanded cooperation with the firms of individual countries, for example, in the following fields: development of automated mining equipment and automatization facilities (Great Britain); comprehensive mechanization of cleaning and preparatory operations and the working of thin coal seams (the FRG); mechanized coal-getting from steeply inclined seams (Spain); and so on.

The CMEA countries have accumulated positive experience of using low-grade fuels for coal-fired electric power stations. It deserves all-around application just the same as the Hungarian techniques of reprocessing coal mines' spoil heaps.

Cooperation is worthwhile in the development and manufacture of heavy coal-cutting equipment, 180-ton dump-trucks, heavy-duty bulldozers and excavators.

It is quite obvious that the coal-mining industry in many countries will keep on expanding and that international relations in this field will broaden. Cooperation and the exchange of scientific and technological experience are useful and needed for mutual benefit.

Oil and Oil-Refining Industry. Before the 1917 Revolution the oil industry was concentrated mainly in the Caucasus. Its development was very slow, with the annual oil extraction never exceeding 11 million tons. In 1940 it rose to 31 million tons. Today the annual production is more than 600 million tons.

Some short-sighted forecasters predicted a fall in Soviet oil production in the early 1980s. They claimed that without Western technology our country would be unable to develop the oil industry and would have instead of exporting to import oil. The prediction went down the drain as the Soviet oil industry achieved unprecedented rates of growth and scope on the base of own techniques and technology.

Western Siberia, in a short span of time, has been dotted with the new large settlements of oil and gas people: Surgut, Nizhnevartovsk, Nefteyugansk, Nadym, Novy Urengoi, etc. These are large modern

cities with modern apartment houses, schools, kindergartens, hospitals and other social and cultural facilities. A railway passes through the tundra and the 'impassable' marshes from Tyumen to Tobolsk, to Nizhnevartovsk, to Urengoi. Hundreds of kilometres of motor highways have been built as well as power stations, electric transmission lines, construction and production facilities and large ports. It should be noted that in 1983 the per day oil production in Western Siberia reached 1,000,000 tons.

Many thousand kilometres of main and local pipelines to transport oil has been laid and are now in operation; intensive methods of oil extraction from oil pools and automation based on highly productive equipment are extensively introduced.

Oil wells are being exploited in the Caspian Sea. It is planned to explore oil deposits in the shelves of northern seas such as the Barentz and the Karsk seas, and near the Sakhalin Island.

The Soviet Union actively cooperates with many countries in oil production. Besides sales and purchases of certain types of equipment the cooperation involves development of various technological processes and opens up important and interesting prospects for many countries, for example, increasing the level of oil extraction. It is common knowledge that now over half of the oil in a deposit is never drawn out. Some day in the future people will come back to bring it to the surface. Right now the cooperation should be spreading to the development of chemical agents, new technologies, equipment and methods of work to achieve a higher oil output.

The Soviet Union is a world leader in oil refining. As to the average unit capacity of oil refineries it outstrips many an industrial nation. The basic trend here is better refining and increased production of engine fuels—also a good and promising project for cooperation.

The gas industry is the most fastly developing sector in the fuel and energy complex. In 1965 gas production in the Soviet Union was equal to 128,000 million cu.m; in 1983 it exceeded 500,000 million cu.m.

A unified gas supply and distribution network, the world largest, has been built in the Soviet Union. It is formed of hundreds of gas- and oil-fields, gas storage facilities and main gas pipelines. The share of gas in

the fuel balance approaches 30 per cent. Gas is used to make steel, pig iron and cement, and is a highly effective chemical base for nitrogen fertilizers. Most of the cities and over 150,000 rural settlements have gas supplies; cheap gas is available to almost everyone in the great expanse of the USSR.

Gas is extracted in the republics of Central Asia, Kazakhstan and the Ukraine, and the Volga region. Unique gas deposits have been discovered at Urengoi, Yamburg, etc., in the northern part of the Tyumen region.

The development of Western Siberia's gas-fields calls for the construction of superlong-distance main pipelines in rigorous climates—a huge, difficult and sophisticated engineering job. Six new gas pipelines will be laid in the current five-year plan period (1981-1985).

The pipelines from the Urengoi deposit cross the entire European part of the Soviet Union. Soviet gas is exported to the CMEA and West European countries, the FRG, Austria, France and Italy among them.

The Urengoi-Pomary-Uzhgorod gas pipeline (almost 4,500 km long, 1,420 mm in diameter) went into operation September 1983. Siberian gas will pass through this pipeline to the West European countries in keeping with respective agreements and ahead of schedule. The construction of this unique world-known project, beating all deadlines, is a vivid page of the industry's historical progress in our country.

Only one year was needed to complete this longest transcontinental pipeline, three times less than the usual technical rate of building. The gas shipments piped to the Urals began on June 6, 1983, and in September the gas reached the USSR Western border (Incidentally, it took the Americans three years to lay the Alaska 1,200 km pipeline made of smaller diameter pipes).

Some statistics of the construction: 130 million cu.m of earth was moved and 2,750,000 tons of pipes laid. Over a thousand kilometres of permanently frozen ground and marshes had to be traversed, and 220 kilometers of underwater pipeline laid across 800 rivers and other water obstacles, including the Don, the Dnieper and the Volga rivers.

Credit for the prompt development and manufacture of own 16 kW and 25 kW gas pumps goes to Soviet machine-makers. It was an outstanding accomplishment on their part. All compressor stations for the first stage of the gas main were assembled from Soviet-made equipment. The GDR, Poland and Bulgaria also made good time in fulfilling their contracted commitments on building the pipeline.

The project was unique from more than an engineering point of view. It was successfully completed despite the known discriminatory measures applied by the US administration.

The factory and construction workers and engineers, the respective research institutes, design bureaux and ministries responsible for the project declared that the pipeline would be completed ahead of schedule whether or not the compressor equipment was delivered by foreign firms and companies.

The construction of the gas pipeline was a striking example of high efficiency and ingenuity, and demonstrated once again the powerful industrial, economic, scientific and technical potential of the Soviet Union.

In January in Urengoi which is within the polar circle, I saw workers in fur-lined working clothes to protect them against a -38°C frost laying the steel gas pipeline. They operated plenty of mechanisms specially adapted for such rigorous northern conditions and were thankful that the marshes were frozen and made their work easier. In addition to the usual welders there were welding automatic machines specially designed and developed by the E.O. Paton electric welding institute (of the Ukrainian Academy of Sciences) which like moles entered the 1,420 mm diameter pipes and welded them together. Only a few minutes were needed to weld the pipes. This heroic work on the far-away Arctic construction site, the enthusiasm and faith of the people in what they were doing aroused the admiration.

The Soviet Union cooperates with socialist and many other countries in developing the oil and gas industries.

Examples of such cooperation are as follows: the Druzhba (Friendship) oil pipeline and the Soyuz gas pipeline as part of the joint efforts of CMEA countries to develop energy systems; a Soviet-Viet-

namese enterprise for oil and gas prospecting and production from Vietnam's sea-shelf in the south of the Republic; Soviet-assisted (economically and technically) oil-extracting facilities (many million tons per annum) in a number of countries; also, Soviet assistance to India and Syria in developing their national oil industries, and to Afghanistan in developing its gas industry.

The prospects of the Soviet Union's economic and technical cooperation with other countries in oil and gas production and raising its technical level are favourable.

In the late November-early December 1983 Moscow hosted an exhibition of French-made oil and gas equipment (Neftegaz-France-83). It was an interesting and useful exhibition in which a large number of firms took part. Many of them have had extensive experience of cooperating with the Soviet Union in the construction of the Orenburg and the Astrakhan gas processing plants and other projects.

Power industry is a basic component of the fuel complex.

As far back as 1920, with the civil war and imperialist intervention at their height, V.I.Lenin insisted on a single plan being worked out for the country's national economic development (the State Plan of Electrification of Russia (GOELRO) which contemplated the development of a number of industries over the next 10-15 years. Lenin called it "the second programme of our Party."[2] The plan envisaged quick development rates for coal, oil, peat and electricity output and the construction of electric power stations with a total capacity of 1.5 million kW. Was that much or little? Now that we build over 10 million kW capacities per annum it seems little. But at that time when Russia lay devastated by the wars it was a fantastic plan. In his book *Russia in the Shadows* Herbert Wells, called Lenin "the Kremlin dreamer". Even this remarkable science fiction writer was unable to imagine that this grandiose plan was feasible. In fact the GOELRO plan figures were exceeded considerably.

In 1940 the USSR's electricity production approximated 50,000 million kWh. In 1983 it exceeded 1,400,000 million kWh.

The Soviet Union is the world leader in the scope

and technical and economic indicators in centralized electricity and heat supplies, as well as in the electrification of transport and other national economic sectors.

The Soviet Unified Power Grid covers most of the country and is coupled to the power grids of a number of other countries. 1,150 kV electric transmission lines are under construction and work is underway to develop technical solutions and equipment for higher voltage lines.

Atomic power engineering. Large 1,000,000 kW unit power reactors are basic equipment for power stations in our country. Soon, however, a 1.5 million kW unit will be installed at the Ignalina station. This is the largest power unit in the world.

Improved and more reliable equipment underlines the current development of the atomic power industry in the Soviet Union. Continuous systematic monitoring indicates that radiation levels in the areas where atomic stations are in operation are well below the permissible limits.

Fast neutron reactors have opened a new page in atomic power engineering. Installations with fast neutron reactors (capacities up to 600,000 kW) were developed and put into successful operation several years ago.

A new feature in atomic power engineering has been the use of atomic thermo-electric plants for towns and cities power-and-heat supply.

The Soviet Union's atomic industry is self-sufficient. Major suppliers of its equipment are the mechanical engineering, electrotechnical and instrument-making industries. A large factory named Atommash has been built for manufacturing complete reactor installations. The manufacture of equipment for atomic power stations involves CMEA member-countries too. Their cooperation is extensive.

Research is underway on controlled thermonuclear reaction which will in the future give a new powerful boost to electricity production.

Hydropower engineering. Soviet hydropower resources are among the largest in the world. There is still much to be done to develop and harness water resources available.

Hydropower resources' uses are multiple and comprehensive: to generate electricity and to spread

irrigation, develop transportation and solve other national economic problems. They are decisive in solving, for example, irrigation problems in the Central Asian republics, the Caucasus, the Ukraine and the Volga region.

Milestones in hydropower development are the 4 to 6 million kW Bratsk and Ust-Ilimsk huge most up-to-date hydro-electric stations on the Angara river and the Krasnoyarsk hydroelectric station on the Enisei river which supply Siberia's productive forces with cheap electricity. The Sayano-Shushenskaya hydro-electric station (more than six million kW) is under construction.

Modern thermal power stations are characterized by the following features: capacities are highly concentrated; equipment works at super-critical steam parametres; and large outputs of electricity and heat. A typical facility in the Soviet Union is a 500,000 to 800,000 kW coal, fuel oil or gas-fired units. The first power unit (more than a million kW) is successfully operating at the Kostroma state regional power station.

Power-and-heat generation and centralized heat supplies for cities and towns are in greater use now. They account for over 60 per cent of the total heat consumption in the country, have a positive ecological effect, and make higher electric power efficiency.

And now a few words about the research and the industrial development on uses of *non-traditional renewable sources of energy*.

The geographical position of the Central Asian republics, the Caucasus, southern Ukraine and Kazakhstan is favourable for applying *solar energy*. This activity is of interest and calls for increased attention.

The heat of the Earth's interior. Vast heat resources comparable in scientists' opinion to those of coal are concentrated in underground thermal waters. Geothermal heating has for many years been in use in various parts of the Caucasus. An experimental geothermal power station has been put to industrial uses in Kamchatka. More stations of this type are planned.

Wind energy is mostly used in agriculture where small installations for this purpose have been devel-

oped. Work is underway to make more powerful facilities capable of generating enough electricity to meet individual consumers' needs in the remote districts. This activity is being encouraged in every way possible to make the wind serve man.

The Soviet Union cooperates in the electricity generating field with many countries both in the construction and R & D of respective facilities, and in the manufacture and mutual delivery of various equipment.

Equal, useful and effective cooperation in power engineering is currently practised with India, Finland, Syria, Iraq and a number of other countries. In the course of mutual cooperation with the CMEA and other countries new tens of million kW capacities have been put into operation, among them: the Boxberg thermal power plant (GDR), the largest in Europe; a hydropower project on the Danube river near the Iron Gates (jointly run by Yugoslavia and Romania); atomic power plants in Bulgaria, Czechoslovakia, the GDR and Hungary; electric transmission lines and other projects.

Built with Soviet technical assistance electric power stations in India and Iraq, Afghanistan and Iran, the Euphrates hydropower project in Syria and the Aswan hydropower complex in Egypt are positive contributions to these countries' progress in industry and agriculture.

The construction of the Loviisa up-to-date atomic power plant in Finland has been the result of useful high-level technical cooperation in atomic energy development between Soviet organizations and Finnish firms.

Many countries are concerned about the safe operation of atomic power plants, the disposal of radioactive waste and reprocessing of irradiated fuel. Greater international cooperation along these lines is very important and urgent as it is too difficult and expensive for each country alone to cope with these problems.

The time has arrived for the design of atomic power plants to be simplified and the construction deadlines reduced. And this is where the opportunities for international cooperation are practically boundless—on modernizing standard energy units and protective shells, on the better positioning of equipment, simpler technological systems and im-

proved safety.

Cooperation in power engineering is varied and effective. It encompasses the development of sophisticated technology, specifically, in thermo-nuclear synthesis and utilization of solar energy, as well as elaboration of the ecological aspects of energy developments, etc.

The plans for the economic development of the Soviet Union provide for a continued accelerated expansion of the fuel and power industries. Particular attention is devoted to the expansion of the gas industry capacities, atomic power development and increased production of cheap coal by open-cast mining.

All these factors are considered in the Energy Programme of the USSR which is directed to achieve structural, technological and organizational changes in the country's economy with the aim to ensure its early switch-over to the intensive and energy-saving mode of development.

Development of the fuel and energy complex brings a wide range of problems which need joint solution by all countries on the basis of cooperation, mutual benefit and extended economic ties.

Energy problems are global in nature and are important to all peoples and countries. There is need for developing atomic power engineering and making it safe, for solving greatest problems facing the present and future of mankind: to use the energy of the seas and oceans, the sun and the wind, to protect the environment.

But for this there must be peace on the Earth; a nuclear war with its disastrous consequences must be averted. Peaceful co-existence and mutually profitable cooperation must prevail. It is in the interest of all humanity to realize this truth.

The same applies to all human activities and to the policies of all governments the world over. The Soviet Union has been taking a firm and consistent stand to prevent war. It has been actively fighting for peace among countries and peoples. This has a most direct and immediate bearing on energy development and the cooperation in this vital peaceful activity of the humanity.

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[1] V.I. Lenin, *Collected Works*, Moscow, 1974, Vol. 30, p. 495.
[2] Ibid., 1982, Vol. 31, p. 514.

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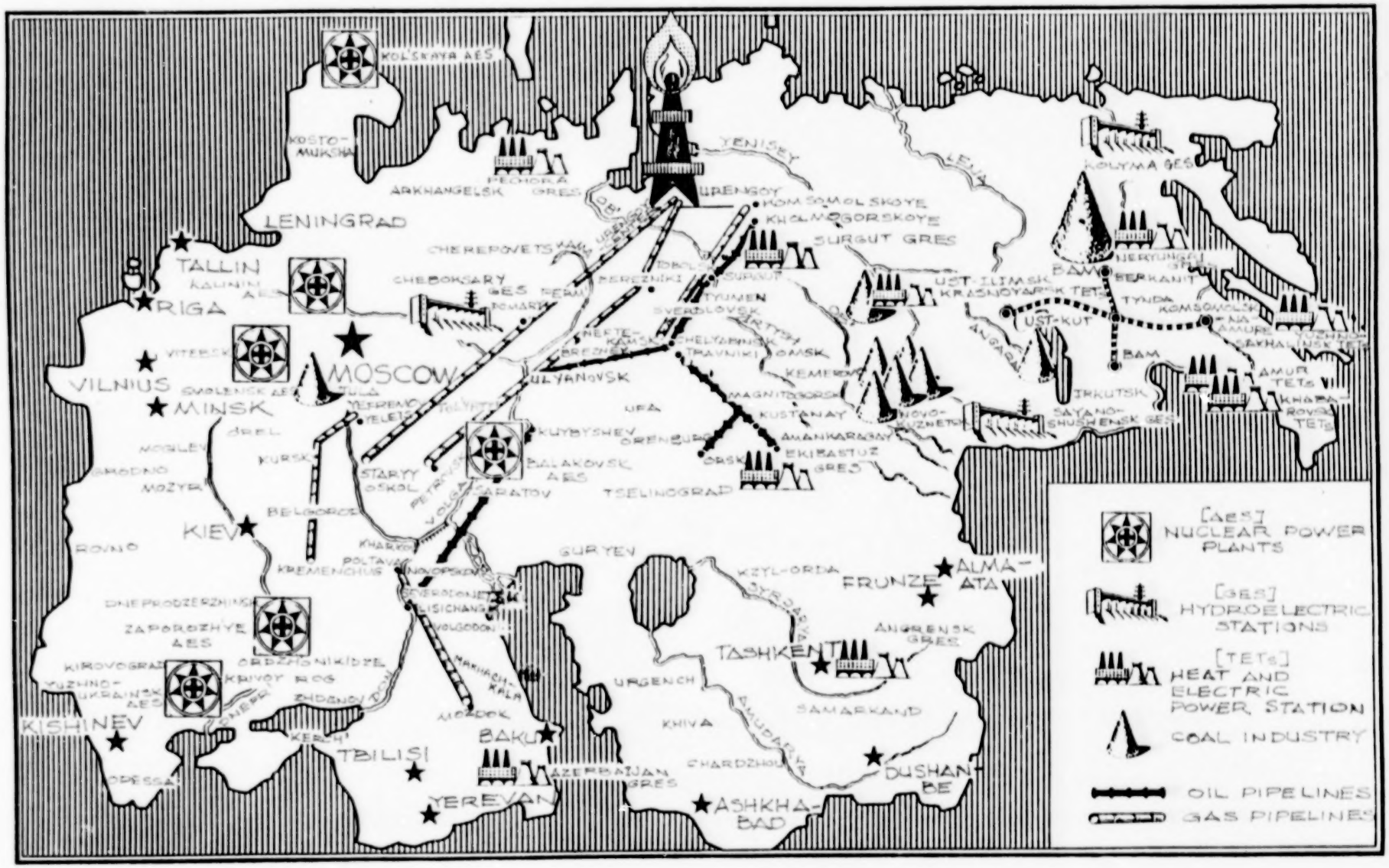
GENERAL

MAP FOR IMPORTANT USSR FUEL, ENERGY COMPLEXES

Moscow ENERGETIK in Russian No 4, Apr 84

/Inside back cover: Map Indicating Important 1984 Objectives of the Energy Program/ /Map next page/

THE FUEL AND ENERGY COMPLEXES
MOST IMPORTANT STARTING STRUCTURES 1984



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BRIEFS

UZBEK SSR ENERGY COMPLEX--Tashkent February 28 TASS--The design capacity of the new fuel and energy complex, being established in Soviet Uzbekistan (Central Asia) will be about 25,000 million kilowatt hours of electricity and 16,000 million cubic metres of natural gas a year. The complex relies on a big gas deposit in spurs of the Pamirs. The first 30 wells have been put into exploitation there. The Pamir gas is mainly intended for the thermal electric power station which is under construction in Talimarjan and which will become the biggest in Central Asia. It will supply energy to industrial centres of the republic. Two pipelines, more than 40 kilometres long, will link the deposit and the station. Orders for the manufacture of pipes and equipment were placed at enterprises of the USSR and a number of foreign countries. The Pamirs gas will be comprehensively used: It is planned to build there a gas-chemical works, a number of other processing enterprises to obtain mineral fertilizers, plastics, artificial fibre out of gas-accompanying substances. Eighty-four more wells are to be drilled. The work is underway at an accelerated pace. [Text] [Moscow TASS in English 0630 GMT 29 Feb 84 LD]

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19 July 84